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greatest sensibility. Probably all hairs are tactile organs. On the dorsal side of the left hand the minimal stimulus for a circular group of pressure points was represented by the figure 0.23, while on certain intermediate points the force necessary to be applied in order to evoke sensation was represented by 1.5. The pressure points on the back of the hand were more sensitive than those upon the middle of the fore-arm and still more so than those upon the thigh. The skin appears most sensitive to pressure where the tactile corpuscles of Krause are most numerous. In true scar tissue neither cold, warm nor pressure points can be discovered. Many points of the skin are insensitive to pain, as tested by needle-puncture, while others are extremely susceptible. It is very probable that sensations of pain depend upon direct injury of a sensory nerve trunk.—*Zeitschr. f. Biologie, Bd. xxi, p. 145.*

PSYCHOLOGY.

Mind and Motion.—The Rede lecture delivered last week in the Senate House, at Cambridge, by Mr. G. J. Romanes, M.A., F.R.S., was entitled "Mind and Motion." After giving some account of the teaching of Hobbes, who laid it down, on the one hand, that all our knowledge of the external world is but a knowledge of motion, and, on the other, that all our acquisitions of knowledge and other acts of mind imply some kind of "motion, agitation, or alteration, which worketh in the brain," Mr. Romanes pointed out, as regards the internal world, that physiology has proved that molecular movements of nervous matter are concerned in all the processes of reflex action, sensation, perception, instinct, emotion, thought, and volition. The lecturer detailed the discoveries which of late years have been made by physiology concerning the rate at which these movements travel along nerves, the period of molecular vibrations in nerve centers, the time required for processes of thought, and the quantitative relations between brain-action and mind-action. When physiological instruments fail to take cognizance of these relations, we gain much additional insight touching the movements of nervous matter by attending to the thoughts and feelings of our own minds, for these are so many indices of what is going on in our brains. Proceeding to contemplate the mind, considered thus as a physiological instrument of the greatest delicacy, he argued that the association of ideas is but an obverse expression of the fact that when once a wave of molecular disturbance passes through any line of nerve structure, it leaves behind it a change in the structure, such that it is afterwards more easy for a similar wave when started from the same point to pursue the same course. Such being the intimate relation between brain-action and mind-action, it has become the scientifically orthodox teaching that the two stand to one another in the relation of cause to effect. He pointed out that the doctrine of conscious automatism is logically the only possible outcome of the theory that nervous changes are the causes of bodily changes, and, therefore, it cannot be fought on grounds of physiology. If we persist in regarding the relation between brain and thought exclusively from a physiological point of view, we must of necessity be materialists. But it does not follow from this that the theory of materialism is true; and other considerations of an extra-physiological kind conclusively prove that the theory is false. We have, first, the general fact that all our knowledge of motion, and so of matter, is merely a knowledge of the modifications of mind. Therefore, so far as we are concerned, mind is necessarily prior to everything else. Thus the theory of materialism assumes that one thing is produced by another thing, in spite of an obvious demonstration that the alleged effect is necessarily prior to its cause. But further, "motion produceth nothing but motion," says Hobbes, and yet he immediately proceeds to assume that in the case of the brain it produces not only motion, but mind. Materialism has to meet the unanswerable question—How is it that in the machinery of the brain motion produces this something which is not motion? Science has now definitely proved the correlation of all the forces, and this means that if any kind of motion could produce anything else that is not motion, it would be producing what science would be bound to regard as in the strictest sense of the word a miracle; causation from brain to mind is in the strictest sense of the word a physical impossibility. *Mutatis mutandis* the theory of spiritualism—which supposes causation to proceed from mind to body—is, he held, but little less unphilosophical than the opposite theory of materialism. For just as it follows from the conservation of energy that motion can produce nothing but motion, so it equally follows that motion can be produced by nothing but motion. Is there, then, any third hypothesis in which we may hope to find intellectual rest? If we unite the elements both of spiritualism and of materialism, we obtain a product which satisfies every fact of feeling on the one hand, and of observation on the other. We have only to suppose that the antithesis between mind and motion, subject and object, is itself phenomenal or apparent, not absolute or real; that the seeming quality is relative to our modes of apprehension; and, therefore, that any change taking place in the mind and any corresponding change taking place in the brain are not really two changes, but one change. There is thus supposed to be only one stream of causation in which both motion and mind are simultaneously concerned; motion is supposed to be producing nothing but motion, mind-changes nothing but mind-changes. Both producing both simultaneously, neither could be what it is without the other, because without the other neither could be the cause which in fact it is. The use of mind to animals is thus explained, for intelligent volition is shown to be a true cause of bodily movement, seeing that the cerebration which it involves would not otherwise be possible. This monistic theory thus serves to terminate the otherwise interminable controversy on the freedom of the will; for the theory shows it to be merely a matter of terminology whether we speak of the mind or of the brain as the cause of bodily movement. That particular kind of physical activity which takes place in the brain could not take place without the occurrence of volition, and *vice versa*. All the requirements alike of the determinist and of the free-will hypotheses are thus satisfied by a synthesis which comprises them both in one. Mr. Romanes afterwards reviewed the opinions of the late Professor Clifford upon this subject, and concluded by observing that if it were true that the voice of science must of necessity speak the language of agnosticism, at least let them see to it that the language was pure; let them not tolerate any barbarisms introduced from the side of aggressive dogma. So would they find that this new grammar of thought did not admit of any constructions radically opposed to more venerable ways of thinking, and that the often-quoted words of its earliest formulator applied with special force to its latest dialects—that if a little knowledge of physiology and a little knowledge of psychology incline men to atheism, a deeper knowledge of both, and still more a deeper thought upon their relations to one another, could only lead men back to some form of religion, which, if it be more vague, will also be more worthy than that of earlier days.

ANTHROPOLOGY.[1]

FURTHER CONFIRMATION OF THE POST-MORTEM CHARACTER OF THE CRANIAL PERFORATIONS FROM MICHIGAN MOUNDS.—In a paper entitled "Burial Customs of our Aborigines," read by the writer before the Ann Arbor meeting of the American Association, August 28, 1885, two fragmentary crania, recently exhumed from a mound on the Detroit river, Michigan, and presenting good examples of the peculiar custom of cranial perforation, were exhibited as illustrations in the anthropological section. The cephalic index of the first specimen would throw it into the medium or orthocephalic group, or to follow the nomenclature of Professor Broca, the mesaticephalic division. The single circular perforation occupies, as usual, a central position at the vertex of the skull, being situated on the sagittal suture, about 0.6 of an inch back of its junction with the coronal suture. The perforation is 0.4 of an inch in diameter, and was probably made in the same manner as were all those I have seen, by a rude stone implement rotated by hand.

The second specimen is evidently not of as great antiquity as

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[1] Edited by Prof. OTIS T. MASON, National Museum, Washington, D. C.